

Appl. No. 10/003,012
Amdt. dated November 7, 2005
Reply to Office Action of January 13, 2006

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1 (previously presented): An apparatus comprising:

- a probe card for testing a die on a wafer;
- an energy transmissive element located adjacent to said probe card at a portion of said probe card; and
- a temperature sensor located near said energy transmissive element for monitoring temperature corresponding to deflection of said probe card,

wherein said energy transmissive element utilizes energy transmitted to selectively deflect a portion of said probe card to selectively control the geometric planarity of said probe card.

Claim 2 (previously presented): The apparatus of claim 1 wherein said energy transmissive element is located generally along a perimeter of said probe card.

Claim 3 (previously presented): The apparatus of claim 2 wherein said energy transmissive element is a thermal element employing thermal energy to selectively deflect a portion of said probe card.

Claim 4 (canceled)

Claim 5 (previously presented): The apparatus of claim 1 further comprising a stiffening element attached to a face of said probe card and adapted to provide structural resistance to planarity deflection of said probe card.

Claim 6 (original): The apparatus of claim 5 further comprising means for facilitating radial expansion/contraction of said probe card with respect to said stiffening element.

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Claim 7 (original): The apparatus of claim 6 further comprising a multi-layer element having a first layer and a second layer, said first layer and said second layer having different rates of expansion per unit of energy, said multi-layer element being attached to said probe card, wherein exposing said multi-layer element to energy causes said multi-layer element to selectively impart deflective forces to a portion of said probe card.

Claim 8 (original): The apparatus of claim 7 wherein said multi-layer element includes two layers of different metals/alloys having a different coefficient of thermal expansion than the other.

Claim 9 (original): The apparatus of claim 8 wherein said multi-layer element is located generally along a perimeter of said probe card.

Claim 10 (previously presented): The apparatus of claim 1 wherein said energy transmissive element is a thermal element employing thermal energy to selectively deflect a portion of said probe card.

Claim 11 (canceled)

Claim 12 (previously presented): The apparatus of claim 1 further comprising a stiffening element attached to a face of said probe card and adapted to provide structural resistance to planarity deflection of said probe card.

Claim 13 (original): The apparatus of claim 1 further comprising means for facilitating radial expansion/contraction of said probe card with respect to said stiffening element.

Claim 14 (original): The apparatus of claim 1 further comprising a multi-layer element having a first layer and a second layer, said first layer and said second layer having different rates of expansion per unit of energy, said multi-layer element being attached to said probe card, wherein exposing said multi-layer element to energy causes said multi-layer element to selectively impart deflective forces to a portion of said probe card.

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Claim 15 (original): The apparatus of claim 14 wherein said multi-layer element includes two layers of different metals/alloys having a different coefficient of thermal expansion than the other.

Claim 16 (original): The apparatus of claim 15 wherein said multi-layer element is located generally along a perimeter of said probe card.

Claims 17-26 (canceled)

Claim 27 (currently amended): An apparatus comprising:

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested, and wherein said probe card comprises a device side that faces said electronic device to be tested and a second side opposite said device side; and

an energy transmissive element disposed to transmit energy to said probe card to counteract thermally induced bowing of said probe card, wherein said energy transmissive element is disposed to affect a temperature on said device side of said probe card.

Claim 28 (canceled)

Claim 29 (currently amended): The apparatus of claim ~~28~~ 27, further comprising another energy transmissive element disposed to affect a temperature on said second side of said probe card.

Claim 30 (previously presented): The apparatus of claim 27 wherein:

said probe card comprises a device side that faces said electronic device to be tested and a second side opposite said device side,

said apparatus further comprises a plurality of said energy transmissive elements disposed to affect selectively and independently a temperature on said device side of said probe card and a temperature on said second side of said probe card.

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Claim 31 (currently amended): ~~The~~ An apparatus of claim 27 further comprising:

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested;

an energy transmissive element disposed to transmit energy to said probe card to counteract thermally induced bowing of said probe card; and

a temperature sensor disposed to monitor a temperature corresponding to said thermally induced bowing of said probe card.

Claim 32 (withdrawn): The apparatus of claim 27 further comprising means for facilitating radial expansion/contraction of said probe card.

Claim 33 (withdrawn): The apparatus of claim 32 further comprising a multi-layer element comprising a first layer and a second layer, said first layer and said second layer having different thermal coefficients of expansion, said multi-layer element being disposed to impart deflective forces to at least a portion of said probe card when exposed to energy.

Claim 34 (withdrawn): The apparatus of claim 27 further comprising a multi-layer element comprising a first layer and a second layer, said first layer and said second layer having different thermal coefficients of expansion, said multi-layer element being disposed to impart deflective forces to at least a portion of said probe card when exposed to energy.

Claim 35 (previously presented): An apparatus comprising:

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested, said probe card comprising a device side that faces said electronic device to be tested and a second side opposite said device side; and

temperature adjustment means for selectively adjusting a temperature at at least one of said device side and said second side to reduce a temperature gradient between said device side of said probe card and said second side of said probe card.

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Claim 36 (previously presented): The apparatus of claim 35, wherein said temperature adjustment means is disposed on at least one of said device side and said second side of said probe card.

Claim 37 (previously presented): An apparatus comprising:

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested, said probe card comprising a device side that faces said electronic device to be tested and a second side opposite said device side; and

means for reducing a temperature gradient between said device side of said probe card and said second side of said probe card,

wherein said means for reducing a temperature gradient is configured to affect independently a first temperature on said device side of said probe card and a second temperature on said second side of said probe card.

Claim 38 (previously presented): The apparatus of claim 37 further comprising a plurality of temperature sensors disposed to monitor said first temperature on said device side of said probe card and said second temperature on said second side of said probe card.

Claim 39 (previously presented): The apparatus of claim 41, wherein said means for reducing a temperature gradient is configured to affect a temperature on said second side of said probe card.

Claim 40 (previously presented): The apparatus of claim 39, wherein testing of said electronic device induces said temperature gradient.

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Claim 41 (previously presented): An apparatus comprising:

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested, said probe card comprising a device side that faces said electronic device to be tested and a second side opposite said device side;

means for reducing a temperature gradient between said device side of said probe card and said second side of said probe card; and

a temperature sensor disposed to monitor a temperature on said device side of said probe card.

Claim 42 (withdrawn): The apparatus of claim 35 further comprising means for facilitating radial expansion/contraction of said probe card.

Claim 43 (withdrawn): The apparatus of claim 42 further comprising a multi-layer element comprising a first layer and a second layer, said first layer and said second layer having different thermal coefficients of expansion, said multi-layer element being disposed to impart deflective forces to at least a portion of said probe card when exposed to energy.

Claim 44 (withdrawn): The apparatus of claim 35 further comprising a multi-layer element comprising a first layer and a second layer, said first layer and said second layer having different thermal coefficients of expansion, said multi-layer element being disposed to impart deflective forces to at least a portion of said probe card when exposed to energy.

Claim 45 (previously presented): The apparatus of claim 35, wherein said temperature adjustment means comprises a thermal control element.

Claim 46 (currently amended): ~~The~~ An apparatus of claim 27, comprising:

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested; and

an energy transmissive element disposed to transmit energy to said probe card to counteract thermally induced bowing of said probe card, wherein said energy transmissive element comprises a thermal control element.

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Claim 47 (currently amended): ~~The~~ An apparatus of claim 27, ~~wherein comprising:~~

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested, and wherein said probe card comprises a device surface that faces said electronic device to be tested and a second surface opposite said device surface that faces away from said electronic device to be tested[.]; and

an energy transmissive element disposed to transmit energy to said probe card to counteract thermally induced bowing of said probe card, wherein said energy transmissive element is configured to adjust selectively a temperature at at least one of said device surface and said second surface to reduce a difference between a temperature at said device surface and a temperature at said second surface, whereby said energy transmissive element counteracts thermally induced bowing of said probe card.

Claim 48 (previously presented): The apparatus of claim 47, wherein said energy transmissive element is configured to adjust selectively said temperature at at least one of said device surface and said second surface to obtain an approximate equality in said temperature at said device surface and said temperature at said second surface.

Claim 49 (previously presented): An apparatus comprising:

a probe card, wherein said probe card is part of an apparatus with a plurality of probes disposed to contact an electronic device to be tested, said probe card comprising a device side that faces said electronic device to be tested and a second side opposite said device side; and means for reducing a temperature gradient between said device side of said probe card and said second side of said probe card,

wherein:

said device side comprises a surface of said probe card that faces said device to be tested and said second side comprises a surface of said probe card that faces away from said device to be tested, and

said means for reducing a temperature gradient further selectively adjusts a temperature at at least one of said device surface and said second surface to reduce a difference between a temperature at said device surface and a temperature at said second surface.

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Claim 50 (previously presented): The apparatus of claim 49, wherein said means for reducing a temperature gradient selectively adjusts said temperature at at least one of said device surface and said second surface to obtain an approximate equality in said temperature at said device surface and said temperature at said second surface.

Claim 51 (previously presented): The apparatus of claim 35, wherein said temperature adjustment means adjusts a temperature at at least one of said device side and said second side during testing of said electronic device.

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